

Name: \_\_\_\_\_

## 2<sup>nd</sup> Semester Final Exam Review Packet – 2013-14

1. "packet has been created to help you review for the first semester exam. Go through this packet filling in information and answering questions to help prepare you for the exam. Be sure to go back, look over and study ALL past quizzes (quick checks, performance checks) and tests.

### Terms, definitions and concepts you should know and understand.

Mass THE AMOUNT OF MATTER AN OBJECT IS MADE UP OF

Volume THE AMOUNT OF SPACE AN OBJECT OCCUPIES

Density THE AMOUNT OF MATTER PER GIVEN SPACE  $D = \frac{M}{V}$

Physical Property A QUALITY THAT CAN BE OBSERVED OR MEASURED WITHOUT CHANGING THE SUBSTANCE ITSELF

Metal (properties/position on PT) VERY REACTIVE, GIVE UP ELECTRONS, LEFT/MIDDLE, MALLEABLE, DENSE, SHINY, CONDUCT ELECTRICITY

Nonmetal (properties/position on PT) NOT AS REACTIVE, TAKE ELECTRONS, RIGHT, BRITTLE, DULL, INSULATORS, /SHARE ELECTRONS

Metalloid (properties/position on PT) SHARE PROPERTIES OF METALS + NON METALS - ON THE STAIR-STEP

Elasticity ABILITY OF A MATERIAL TO BE STRETCHED AND RETURN BACK TO ITS ORIGINAL SHAPE (RESIST DEFORMATION)

Malleability ABILITY TO BE BENT WITHOUT BREAKING/HAMMERED INTO SHEETS WITHOUT SHATTERING

Conductivity ALLOWS THE FREE FLOW OF  $e^-$  (ELECTRONS)

Brittle BREAKS/SHATTERS WHEN HIT WITH A HAMMER/UNDER PRESSURE

Ductility ABILITY TO BE DRAWN OUT INTO THIN WIRE

Magnetic ABLE TO ATTRACT IRON & OTHER MATERIALS BY A SURROUNDING FIELD OF FORCE

Heat (Thermal Energy) TOTAL KINETIC ENERGY

Temperature AVERAGE KINETIC ENERGY

Phase change A CHANGE FROM ONE STATE TO ANOTHER WITHOUT CHANGE IN CHEMICAL COMPOSITION

Solid - HIGHER DENSITY, DEFINITE SHAPE, DEFINITE VOLUME, PARTICLES LOCKED IN PLACE, VIBRATE IN PLACE

Liquid - MEDIUM DENSITY, DEFINITE VOLUME, INDEFINITE SHAPE, PARTICLES ARE CLOSE BUT SLIDE PAST ONE ANOTHER

Gas - LOW DENSITY, TAKES SHAPE OF CONTAINER, INDEFINITE SHAPE & VOLUME, PARTICLES ARE MOVING FAST & FREELY

Condensation - PHASE CHANGE FROM GAS TO LIQUID (ENERGY REMOVED)



Evaporation PHASE CHANGE FROM LIQUID TO GAS (ENERGY ADDED)

Sublimation PHASE CHANGE FROM SOLID TO GAS (ENERGY ADDED)

Deposition PHASE CHANGE FROM GAS TO SOLID (ENERGY REMOVED)

Melting PHASE CHANGE FROM SOLID TO LIQUID (ENERGY ADDED)

Boiling PHASE CHANGE FROM LIQUID TO GAS (ENERGY ADDED)

Freezing PHASE CHANGE FROM LIQUID TO SOLID (ENERGY REMOVED)

Physical change A CHANGE FROM ONE STATE TO ANOTHER OR A REARRANGEMENT OF A SUBSTANCE WITHOUT A CHEMICAL CHANGE

Chemical property A CHARACTERISTIC OF A PURE SUBSTANCE THAT DESCRIBES ITS ABILITY TO CHANGE INTO DIFFERENT SUBSTANCES

Periodic Table THE ARRANGEMENT OF THE ELEMENTS IN ORDER OF THEIR ATOMIC # (# OF PROTONS) ELEMENTS WITH SIMILAR PROPERTIES ARE GROUPED IN

Period/Row HORIZONTAL ROW ON P-TABLE

Group/Family COLUMN ON P-TABLE - ELEMENTS IN SAME FAMILY SHARE SIMILAR PROPERTIES

Mixture 2 OR MORE SUBSTANCES NOT CHEMICALLY COMBINED

Element - BUILDING BLOCKS OF MATTER - MADE OF ~~THE~~ ATOMS OF THE SAME TYPE

Atom - SMALLEST UNIT OF MATTER / SMALLEST UNIT OF AN ELEMENT THAT RETAINS SPECIFIC CHEMICAL + PHYSICAL PROPERTIES MADE OF P, N & E

Proton - POSITIVELY CHARGED SUBATOMIC PARTICLE - FOUND IN NUCLEUS

Neutron - NEUTRAL SUBATOMIC PARTICLE - FOUND IN NUCLEUS

Electron - NEGATIVELY CHARGED SUBATOMIC PARTICLE - FOUND IN ELECTRON CLOUD (ORBITS / ENERGY SHELLS)

Compound - 2 OR MORE ATOMS OF DIFFERENT TYPES CHEMICALLY BOUND

Molecule - 2 OR MORE ATOMS CHEMICALLY BOUND

Homogeneous mixture - UNIFORM THROUGHOUT - COMPOSED OF SOLUTE & SOLVENT KNOWN AS A SOLUTION

Heterogeneous mixture - NOT UNIFORM THROUGHOUT - COULD BE A COLLOID OR A SUSPENSION - BLOCK LIGHT

Chemical change - A CHANGE THAT PRODUCES A NEW SUBSTANCE

Atomic number - NUMBER OF PROTONS

Atomic (average) Mass - AVERAGE MASS OF ALL THE ISOTOPES OF A SPECIFIC ELEMENT - REFLECTIVE OF ISOTOPES RELATIVE

Mass number - NUMBER OF PROTONS AND NEUTRONS ABUNDANCE



Electron energy levels/orbits/shells ELECTRONS MOVE AROUND THE NUCLEUS

AT A SET DISTANCE AND IN A SET PATTERN; LOWER LEVELS MUST BE FILLED BEFORE HIGHER LEVELS

Valence electrons

OUTER MOST ELECTRONS - RESPONSIBLE FOR BONDING

Ionization energy - ENERGY REQUIRED TO REMOVE AN ELECTRON FROM A NEUTRAL ATOM

Ion CHARGED ATOM (CAN BE + OR -)

Net Charge/Ionic Charge # OF ~~PRO~~ REFLECTING HOW MANY ELECTRONS HAVE BEEN TAKEN OR GIVEN AWAY

Cation POSITIVELY CHARGED ION

Anion NEGATIVELY CHARGED ION

Ionic bond BOND FORMED BY THE ATTRACTION OF OPPOSITELY CHARGED IONS

Covalent bond BOND FORMED BY SHARING OF ELECTRONS

Isotope - ATOMS W/ THE SAME # OF PROTONS, DIFFERENT # OF NEUTRONS

Subscript - # IN CHEMICAL FORMULA THAT INDICATES THE # OF ATOMS OF A SPECIFIC TYPE IN A COMPOUND OR MOLECULE

Coefficient # IN FRONT OF A CHEMICAL FORMULA INDICATING HOW MANY OF THOSE COMPOUNDS OR MOLECULES ARE REQUIRED TO HAVE A BALANCED EQUATION

Reactants

LEFT HAND SIDE - STARTING MATERIALS

Products

RIGHT HAND SIDE - FINAL MATERIALS

Law of Conservation of Mass - MATTER/MASS CANNOT BE CREATED OR DESTROYED ONLY REARRANGED

Exothermic - GIVES OFF HEAT

Endothermic - ABSORBS HEAT

pH - POTENTIAL HYDROGEN

Acid - pH LOWER THAN 7 - HAVE AN ABUNDANCE OF  $H^+$  IONS

Base - pH HIGHER THAN 7 - HAVE AN ABUNDANCE OF  $OH^-$  IONS

Neutral - pH OF 7

Electromagnetic/Electrostatic ATTRACTIVE FORCE BETWEEN OPPOSITE CHARGES  
REPULSIVE FORCE BETWEEN LIKE CHARGES

Fusion - COMBINING OF SMALLER ELEMENTS TO FORM LARGER ONES

Fission - SPLITTING APART OF A LARGE UNSTABLE NUCLEUS INTO 2 OR MORE LIGHTER/SMALLER NUCLEI



Red-shift - STRETCHING OF WAVELENGTHS AS OBJECTS MOVE AWAY

Blue-shift - SHORTENING OF WAVELENGTH AS OBJECTS MOVE CLOSER

Extra practice for terms can be found at:

<http://quizlet.com/1583411/physcal-science-1st-sem-exam-review-flash-cards/>

<http://www.sporcle.com/games/DCHScience/physsci1>

1. How did each of the following contribute to the modern theory of the atom? If they used technology, how did it help their understanding of the atom?

Democritus FIRST TO "DISCOVER" THE ATOM - SAID ALL MATTER CONSISTS OF SMALL INDIVISIBLE PARTICLES CALLED 'ATOMS'

John Dalton SAID ALL ATOMS OF THE SAME ELEMENT ARE EXACTLY ALIKE, ATOMS OF DIFFERENT ELEMENTS ARE DIFFERENT, ATOMS COME TOGETHER IN DEFINITE PROPORTIONS & ATOMS ARE NOT DIVISIBLE

JJ Thomson SAID ATOMS ARE SPHERES OF POSITIVE MATTER IN WHICH NEGATIVE ELECTRONS ARE RANDOMLY SCATTERED THIS IS THE PLUM PUDDING MODEL WE KNOW THIS IS NOT TRUE

Ernest Rutherford FOUND THAT THERE WAS A MASSIVE POSITIVELY CHARGED CENTER IN THE ATOM CALLED THE NUCLEUS - FOUND THIS THROUGH THE GOLD FOIL EXPERIMENT

Niels Bohr SAID ELECTRONS MOVE AROUND THE NUCLEUS IN SET ORBITS & EACH ORBIT CAN ONLY HOLD A CERTAIN NUMBER OF ELECTRONS

James Chadwick DISCOVERED THE NEUTRON - HAS NO CHARGE BUT THE SAME MASS AS A PROTON

2. Using scientific terms, what do each of these arrows represent?

8	←	ATOMIC #
<u>O</u>	←	ELEMENT SYMBOL
Oxygen	←	ELEMENT NAME
15.9994	←	ATOMIC MASS (AVERAGE)



Period vs Group (Family):

Periods go from LEFT to RIGHT across the Periodic Table (horizontally)

Groups/Families go TOP and TO BOTTOM vertically on the Periodic Table.

There are 7 periods and 18 groups on the Periodic Table of Elements.

Periods determine the number of ENERGY levels (shells/orbits)

Groups determine the number of VALENCE electrons and CHEMICAL properties.

Practice:

a) What element is in period 3 group 17? CHLORINE

b) Circle the two elements with similar chemical properties

K C Mg Ca B

c) Radon has 6 energy levels and 8 valence electrons.

4. Explain or draw the trends or patterns found on the periodic table for the following:

Atomic Radius  $\downarrow$   
Atomic Number  $\rightarrow$   
Atomic Mass  $\rightarrow$   
Reactivity  $\downarrow$   
Ionization Energy  $\uparrow$   
Valence Electrons  $\rightarrow$

III LIQUID @ RT

□ SOLID @ RT

■ GAS @ RT

NON METALS

Metal/Non-metals/Metalloids/State at room temperature

Blank Periodic Table of the Elements

<http://chemistry.about.com>  
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METALS

METALLOIDS

REACTIVITY INCREASING  
ATOMIC RADIUS INCREASING  
IONIZATION ENERGY INCREASES  
ATOMIC # INCREASING

ATOMIC # INCREASING

# OF VALENCE  $e^-$  INCREASING

REACTIVITY INCREASING

ATOMIC RADIUS INCREASING

IONIZATION ENERGY INCREASES

ATOMIC MASS INCREASING



5. You should know the mass, charge and location for the following subatomic particles:

Subatomic Particle	Location	Charge	Mass	Role/Importance
Protons	NUCLEUS	+	1	GIVES ATOMS THEIR IDENTITY
Neutrons	NUCLEUS	NONE	1	STABILIZING THE NUCLEUS (GLUE)
Electrons	ORBITALS	-	0	REACTIVITY/BONDING

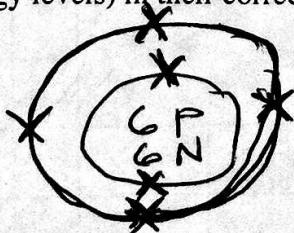
6. Atomic mass is the number of PROTONS added to the number of NEUTRONS

Practice: a) How many Ps and Ns does Sulfur have?  $P(16) + N(16) = \text{mass \#}(32)$   
 an element has 8 protons, 7 neutrons and 8 electrons its mass # is 15 amu

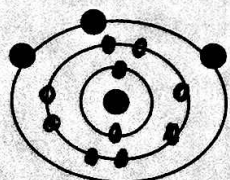
7. Determine how many protons, neutrons and electrons are in a neutral atom.

Element	Symbol	Atomic #	Mass #	# of Protons	# of Neutrons	# of Electrons
Carbon	C	6	12	6	6	6
Silicon	Si	14	28	14	14	14
IRON	Fe	26	56	26	30	26

8. Take ONE element (from the chart in question #14) and draw it below placing the correct number of protons, neutrons and electrons (in their proper energy levels) in their correct positions in the atom.  
 (Hint: Bohr Model) CARBON



9. Valence Electrons: Fill in the first two energy levels with the correct number of electrons then fill in the blanks below.



Total # of electrons	Element symbol	# of valence electrons	Metal/Non Metalloid or Family name	Group #	Period #
<u>13</u>	<u>AL</u>	<u>3</u>	<u>METAL</u> <u>BORON FAMILY</u>	<u>13</u> <u>MAIN GROUP</u> <u>3</u>	<u>3</u>

If the element above lost one electron it becomes a positive ION.



Ions:

In a neutral atom, the number of protons EQUALS the number of electrons.

If you have more electrons (atom gained electrons) it is called a NEGATIVE ion

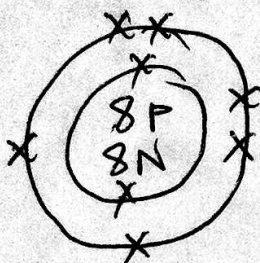
If you have more protons (atom has lost electrons) it is called a POSITIVE ion.

Practice: a) What family on the Periodic Table is most likely to become +3 ion BORON FAMILY

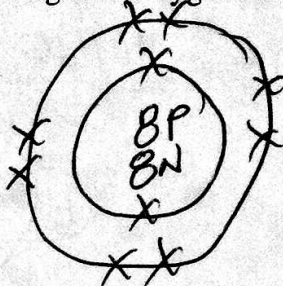
b) What family on the Periodic Table is most likely to become -2 ion OXYGEN FAMILY

c) Draw a Bohr model of a neutral Oxygen atom then make it a negative ion.

Neutral Oxygen



Negative Oxygen Ion



## 11. Bonding:

What subatomic particle determines how atoms bond (interact)? ELECTRONS

Ionic bond is when electrons are TRANSFERRED

Ionic bonds form between metals and NON METALS

Covalent bonds are when electrons are SHARED

Covalent bonds form between nonmetals and NON METALS

The number of valence electrons all atoms want to reach to be stable is 8  
(2 for H, He, Li, Be, B)

## 12. Writing a chemical formula for a compound:

Practice;

a) Determine the chemical formula if Mg and F bonded.

First determine the number of valence electrons to determine if it is in excess or deficient of electrons.

Mg has 2 valence electrons so it wants to get/give (circle) 2 electron

F has 7 valence electrons so it wants to get/give (circle) 1 electron

Is this an ionic or covalent bond? IONIC The correct formula is MgF<sub>2</sub>

b) Determine the chemical formula for H and Cl

Remember H needs 2 electrons to fill its single energy level.

Is this an ionic or covalent bond? COVALENT The correct formula is HCl



13. Use the elements Boron and Oxygen to complete the next few questions:

How many valence electrons does each have?  $B = \overset{3+}{3}$   $O = \overset{2-}{6}$

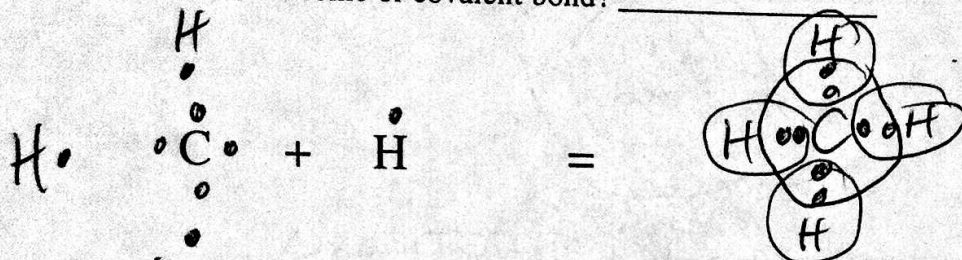
How would you write the correct formula if they bonded?  $B_2O_3$

Is this an ionic or covalent bond? IONIC

14. Draw the Lewis Dot diagram for the elements below. Show how they can combine to form a stable compound.



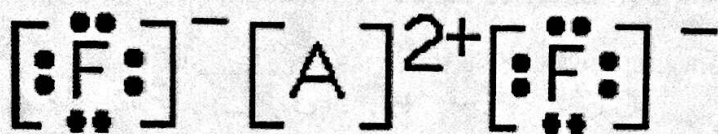
Is this an ionic or covalent bond? IONIC



Is this an ionic or covalent bond? COVALENT

Circle the shared pairs of electrons. ✓

15.



In the molecule above, identify which elements could possibly be inserted for letter A?

Be, Mg, Ca, Sr, Ba, Ra

16. In the following compounds, identify the number of atoms for each element.

a.  $4H_2SO_4$

$H = 8$   
 $S = 4$   
 $O = 16$

b.  $2C_6H_{12}O_6$

$C = 12$   
 $H = 24$   
 $O = 12$

c.  $3Ca_3(PO_4)_2$

$Ca = 9$   
 $P = 6$   
 $O = 24$

17. Chemical Equations:

Substance to the left of the arrow are called REACTANTS

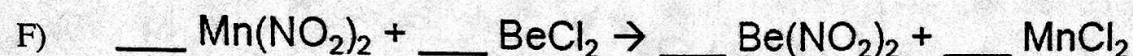
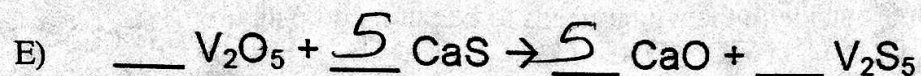
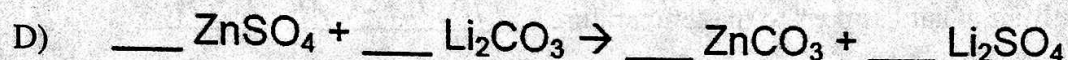
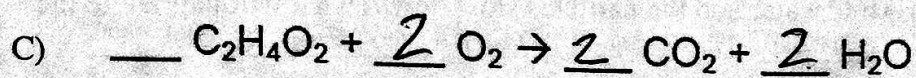
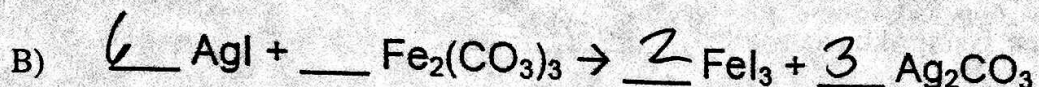
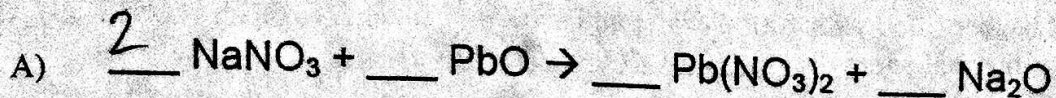
Substance to the right of the arrow are called PRODUCTS

Whatever elements are on the left must be on the RIGHT.

The total mass of reactants must be EQUAL to the mass of the products = Law of Conservation of Mass.



18. Balance the following equations:



19. Isotopes:

Part 1:

An isotope is an element with a different number of NEUTRONS which changes its MASS.

Practice: Look up Xenon's atomic mass 131

What would be the amount of neutrons in each isotope if there were only two isotopes?

77 or 78

Which isotope above would occur in the greater amount (circle the correct answer)

Part 2:

Atom #1: 10P 10N 10E

Atom #2: 11P 11N 11E

Atom #3: 10P 11N 12E

Which atom is a different element from the others? ATOM 2

Which two atoms are isotopes of each other? # 1 and # 3

Which atom is a negative ion to atom #1? # 3

20. Thermal Energy and Temperature

Temperature is the average KINETIC energy of the substance.

Temperature is measured using a THERMOMETER

Thermal (heat) energy is a measure of TOTAL KINETIC energy in the substance.

As temperature increases so does the average KINETIC ENERGY.

If particles begin to slow down, the temperatures DECREASES



Practice:

a) If you have a 50ml beaker filled with 100° C water and a 100ml beaker filled with 100° C water, which has the great amount of thermal energy? 100 ML BEAKER

b) Which has the greatest average kinetic energy? SAME

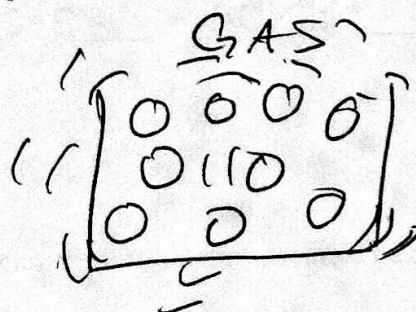
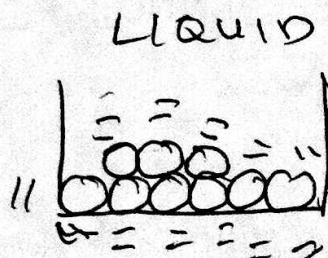
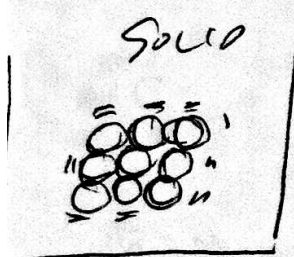
c) If you have a 50ml beaker of 100° C water and the particles slow down, what will happen to the temperature? DECREASES Thermal energy? DECREASES

d) If an ice cube is melting, what happens to the temperature? STAYS-CONSTANT

e) Explain why your basketball left outside in the winter needs to be pumped up again.

PARTICLES SLOW DOWN & RUN INTO THE BALLS SIDES LESS EXERTING LESS PRESSURE

Draw a picture that represents the molecular motion of a solid, liquid and a gas.



Density:

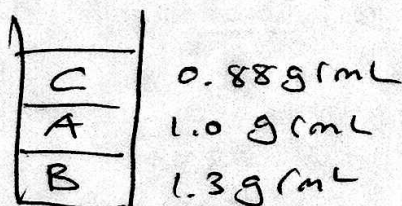
The formula for density is  $m \div v$ . Density is labeled  $g/mL$  or  $g/cm^3$

Practice:

a) If an object has a volume of 5.5 cm<sup>3</sup> and a mass of 3.0 g, what is its density? Show work below.

$$\frac{3.0g}{5.5cm^3} = 0.545 \frac{g}{cm^3} = 0.55 \frac{g}{cm^3}$$

b) If you have 3 unknown liquids that have 3 different densities, (A=1.0g/ml, B=1.3g/ml and C = .88g/ml) draw a picture below of how they would settle out in a test tube?



23. a. If something has a pH of 2, it would be considered a(n) ACID.

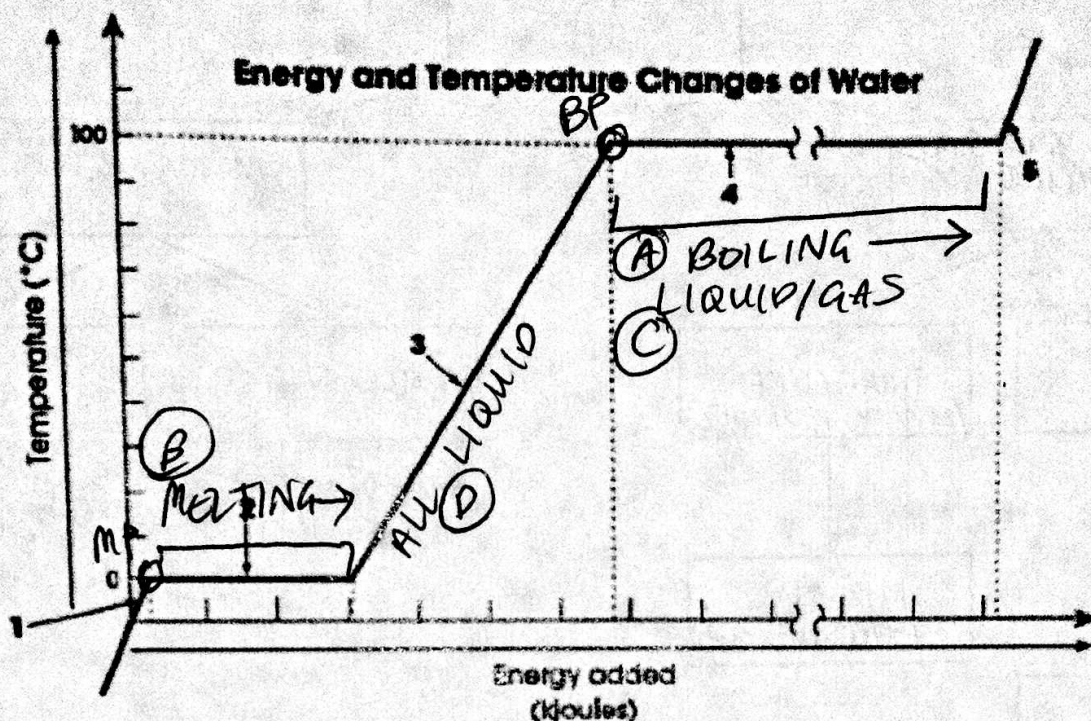
b. If something has a pH of 10, it would be considered a(n) BASE.

c. If something has a pH of 7, it would be considered a(n) NEUTRAL.



4. Look at the graph below that represents data collected when a beaker of ice is heated on a hot plate. Use the graph to complete the questions below.

The following graph shows the change in temperature of a sample of  $H_2O$ , which begins as ice, as thermal energy is added.

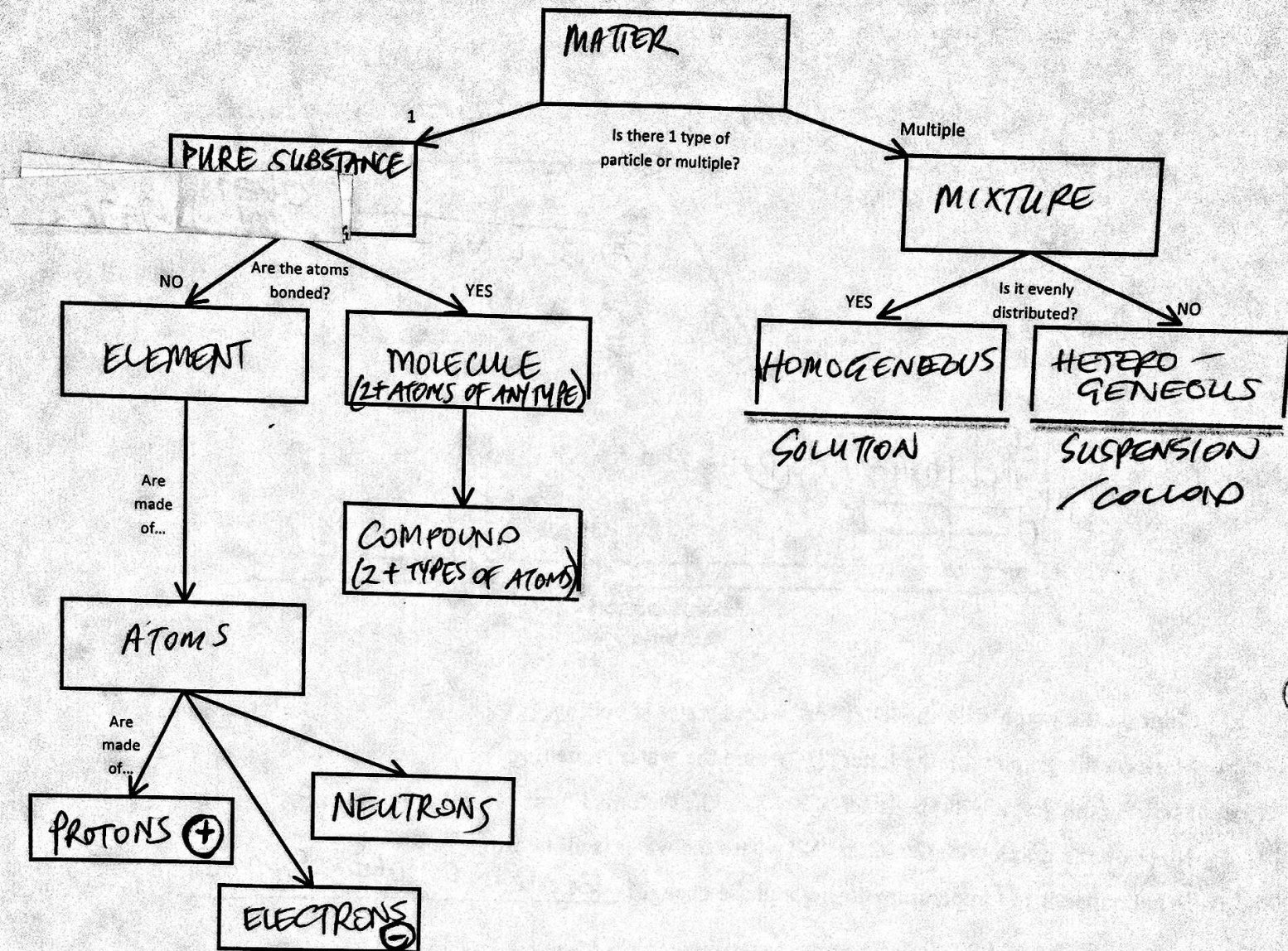


- a) Mark on the graph with the letter "A" where water is boiling.
- b) Mark on the graph with the letter "B" where the water is melting.
- c) Mark on the graph with the letter "C" where the water is liquid and gas.
- d) Mark on the graph with the letter "D" where the water is all liquid.
- e) What happens to temperature during a phase change? REMAINS THE SAME



25. Look at the flow chart of matter below. Fill in the correct terms based on what you learned in class.

Next to each term you fill in, list an example of that term whenever possible





# Big Bang

Identify and explain the 3 key pieces of evidence that support the Big Bang Theory

1. FUSION ( $H + H \rightarrow He$ )

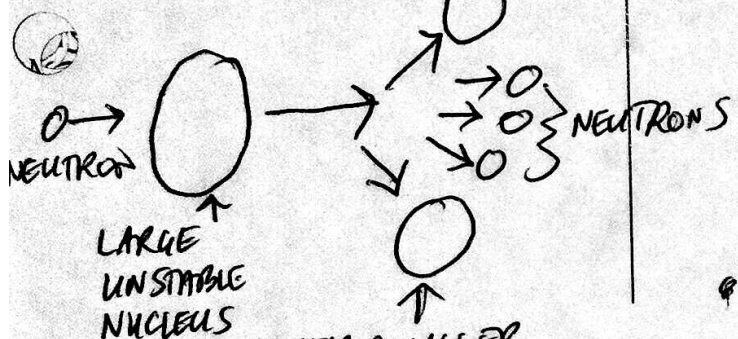
2. BACKGROUND RADIATION (VISIBLE LIGHT FROM BIG BANG STRETCHED IN MICROWAVES WHICH ARE SEEN IN ALL DIRECTIONS)

3. RED SHIFT OF LIGHT (- SPECTRAL LINES SHIFTED TOWARD THE RED END OF THE SPECTRUM BC WAVELENGTHS ARE BEING STRETCHED)

27. Compare and contrast Fission and Fusion (explain, draw, end products and where it takes place)

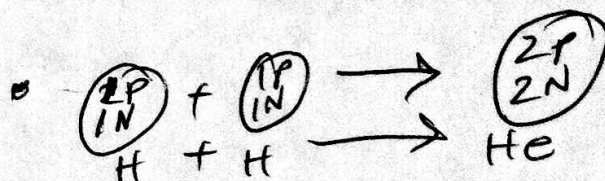
FISSION

SMALLER NUCLEUS



- HAPPENS IN NUCLEAR POWER PLANTS
- A NEUTRON BOMBARDS A LARGE UNSTABLE NUCLEUS & IT BREAKS APART INTO SMALLER NUCLEI AND RELEASE MORE NEUTRONS

FUSION



- 2 LIGHT NUCLEI ARE JOINED TOGETHER TO FORM A LARGER NUCLEUS
- HAPPENS IN THE SUN/STARS

If you have any questions while taking the exam, PLEASE ask your teacher for clarification. They can't give you the answer but they can help you understand what is being asked. Be sure to get a good night sleep before the exam and eat a healthy breakfast before you come in.

The Physical Science teachers would like to thank each and every one of you for all the effort and time you have put into this class. Please stop by and visit next year and let us know how you are doing in Biology (or any other science class you might be taking). NOW before you think you are done - Go back and double check all your answers to be sure you have not made any careless mistakes. Did you show all your work and label all your answers correctly?  
 51. NOT LEAVE ANYTHING BLANK..... ask for help!